



US006894950B1

(12) **United States Patent**
Barden et al.

(10) **Patent No.:** **US 6,894,950 B1**
(45) **Date of Patent:** **May 17, 2005**

(54) **UNDERWATER VEHICLE THERMAL
BOUNDARY DETECTION SYSTEM**

5,214,617 A * 5/1993 Rouquette 367/124

FOREIGN PATENT DOCUMENTS

(75) Inventors: **Robert J. Barden**, Portsmouth, RI
(US); **William B. Grailich**, Portsmouth,
RI (US)

JP 01124730 A * 5/1989

* cited by examiner

(73) Assignee: **The United States of America as
represented by the Secretary of the
Navy**, Washington, DC (US)

Primary Examiner—Ian J. Lobo

(74) *Attorney, Agent, or Firm*—James M. Kasischke;
Michael F. Oglo; Jean-Paul A. Nasser

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

(57) **ABSTRACT**

A thermal sensor system is provided in combination with a maneuverable vehicle, particularly in an underwater application. The system includes a transport pipe having an intake and output for the passage of seawater. A thermal sensor is connected to the transport pipe for detecting an actual temperature of seawater within the transport pipe. Sensor electronics are provided in connection with the thermal sensor, the sensor electronics conditioning signals output by the thermal sensor. The selective sampling by the thermal sensor may either be intermittent or continuous according to system needs. Further, a control device is connected to the sensor electronics, acoustic equipment and a depth sensor in connection with the maneuverable vehicle allowing change of the vehicle's course in response to these inputs.

(21) Appl. No.: **09/923,257**

(22) Filed: **Aug. 2, 2001**

(51) **Int. Cl.⁷** **G01S 3/80**; G01S 15/66

(52) **U.S. Cl.** **367/131**; 367/124; 367/96

(58) **Field of Search** 367/87, 88, 131,
367/902, 124, 96; 73/170.33

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,974,213 A * 11/1990 Siwecki 367/88

5,206,640 A * 4/1993 Hirvonen et al. 340/852

14 Claims, 2 Drawing Sheets

